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Fecundity of the allochthonous feeder, *Rasbora daniconius* (Ham.) and of the autochthonous feeder, *Puntius amphibius* (Val.)

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Abstract. The fecundity of an allochthonous feeder, *Rasbora daniconius* and an autochthonous feeder, *Puntius amphibius* in a perennial tropical pond was assessed and found to be higher in the latter. The fecundity of each of the species was correlated with parameters like standard length, weight of fish, length and weight of ovary. A comparison of the regression coefficients in the relations statistically confirmed that as the length or weight of the fish and the length of the ovary increased the rate of increase in the number of eggs was greater in *P. amphibius* suggesting a better assimilation of the autochthonous food by *P. amphibius* than of the allochthonous food by *R. daniconius*.

Keywords. Allochthonous feeder; *Rasbora daniconius*; fecundity; *Puntius amphibius*; autochthonous feeder.

1. Introduction

Knowledge about the number of eggs produced by fishes is of great importance for aquaculture. Qasim and Qayyum (1963) discussed the different ways in which knowledge about the fecundity would be useful to the fishery biologist. Fecundity studies have been carried out on a large number of freshwater fishes of India (Alikunhi and Chaudhuri 1954; Qasim and Qayyum 1963; Bhatnagar 1964, 1972; Das 1964; Parameswaran *et al* 1971; Saxena 1972; Selvaraj *et al* 1972; Varghese 1973; Sinha 1975; Bhatt *et al* 1977; Jhingran 1977; Pathak and Jhingran 1977; Bisht and Upadhay 1979; Pathani 1981). In the present paper the fecundity of an allochthonous feeder, *Rasbora daniconius* and an autochthonous feeder, *Puntius amphibius* is compared in relation to the type of food they consume.

2. Material and methods

The fishes were collected wild from a perennial pond during their breeding season (June to August). Various body measurements were taken before cutting open the abdomen and removing the ovary. On the whole 55 ripe ovaries of *R. daniconius* (47 and 88 mm standard length) and 47 ovaries of *P. amphibius* (65 and 105 mm standard length) were used for the study. For calculating the fecundity, the gravimetric method by which the number of eggs in accurately weighed subsamples being multiplied by the total weights of the ovaries was adopted. The final figure of fecundity was arrived at based on the average of the weights and number of eggs in three subsamples of each ovary.

In both the species the correlation between the fecundity and parameters like standard length, weight of fish, length and weight of ovary was calculated. These relationships were studied by the method of least squares according to which either the linear equation, $Y = a + b\ X$ or $\log Y = \log a + b \log X$, a linear transformation of $Y = a\,x^b$, was fitted, where Y stood for fecundity and a and b were constants; X stood for body measurements such as standard length (Sl); total body weight (Bw); length of ovary (Ol) and ovary weight (Ow). The constants a and b were calculated in each case.

3. Results and discussion

The fecundity varied between 929 and 7398 in *R. daniconius* and from 3379 to 24485 in *P. amphibius*. The higher fecundity of the latter clearly highlights a higher rate of egg production in *P. amphibius* than in *R. daniconius.*

According to table 1, the relationship between the fecundity (F) and the total body weight, the length and weight of ovary was linear (figures 2, 3 and 4) and that between fecundity and standard length of the fish, was curvilinear (figure 1) in *R. daniconius*. In *P. amphibius*, the relationship between fecundity and total body weight of the fish and length of ovary was linear (figures 6 and 7 respectively) and that between fecundity and standard length of the fish and weight of ovary was curvilinear (figures 5 and 8 respectively) suggesting that the pattern of relationship between fecundity and other parameters, except the weight of ovary was similar in both *R. daniconius* and *P. amphibius.*

The correlation coefficient worked out between the fecundity and other parameters were significant in both the species ($P < 0{\cdot}01$).

Therefore, as the length or weight of fish and the length of ovary increased, the rate of increase in the number of eggs was greater in the autochthonous feeder, *P. amphibius* than in the allochthonous feeder, *R. daniconius*. This suggests that the autochthonous food in the pond, though according to the chemical analysis was less nutritive than the allochthonous food is better made use of by *P. amphibius* which may result in higher egg production also. This is natural because *P. amphibius* was found to have better

Table 1. The regression and correlation coefficients between the fecundity of *R. daniconius* and *P. amphibius* and other variables of each species with equations used in each case.

Species	Variable	Equation	Regression coefficient	Correlation coefficient
	Sl	$\text{Log F} = -0{\cdot}2693 + 2{\cdot}0441 \log Sl$	2·0441	0·7138*
	Bw	$482{\cdot}0670 + 0{\cdot}4315\ Bw$	0·4315	0·7350*
R. daniconius	*Ol*	$-2537{\cdot}8400 + 18{\cdot}2253\ Ol$	18·2253	0·6260*
	Ow	$166{\cdot}2626 + 3{\cdot}0051\ Ow$	3·0051	0·8866*
	Sl	$\text{Log F} = -1{\cdot}2835 + 2{\cdot}6633 \log Sl$	2·6633	0·6904*
	Bw	$-1989{\cdot}5533 + 0{\cdot}6023\ Bw$	0·6023	0·7893*
P. amphibius	*Ol*	$12085{\cdot}8130 + 518{\cdot}6034\ Ol$	518·6034	0·7200*
	Ow	$\text{Log F} = 9{\cdot}9793 + 0{\cdot}8765 \log Ow$	0·8765	0·9581*

* Significant ($P < 0{\cdot}01$)

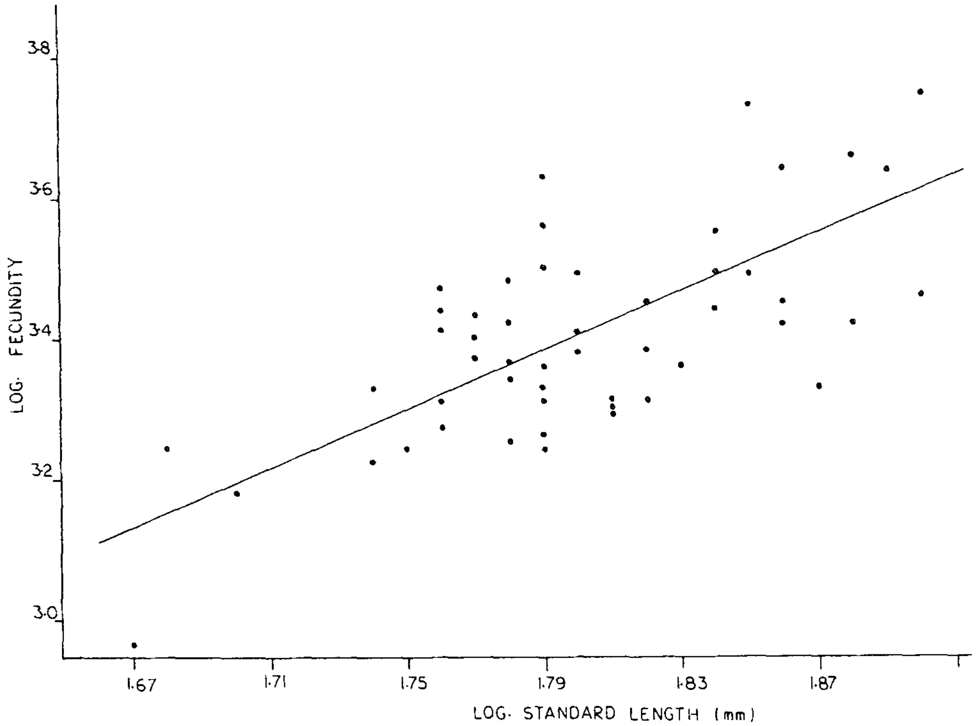

Figure 1. Standard length-fecundity relationship in *R. daniconius*.

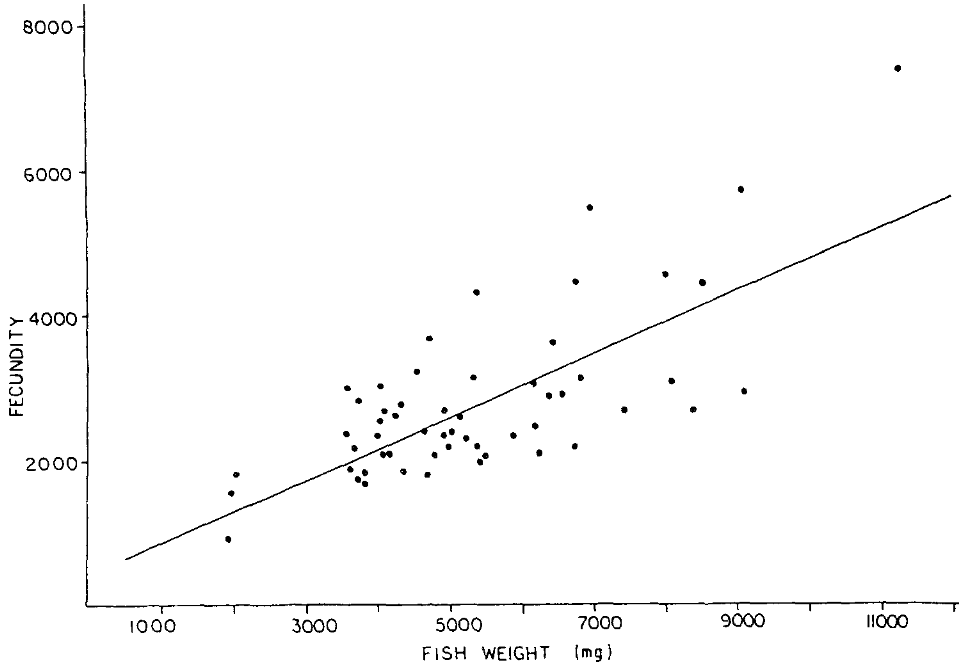

Figure 2. Body weight-fecundity relationship in *R. daniconius*.

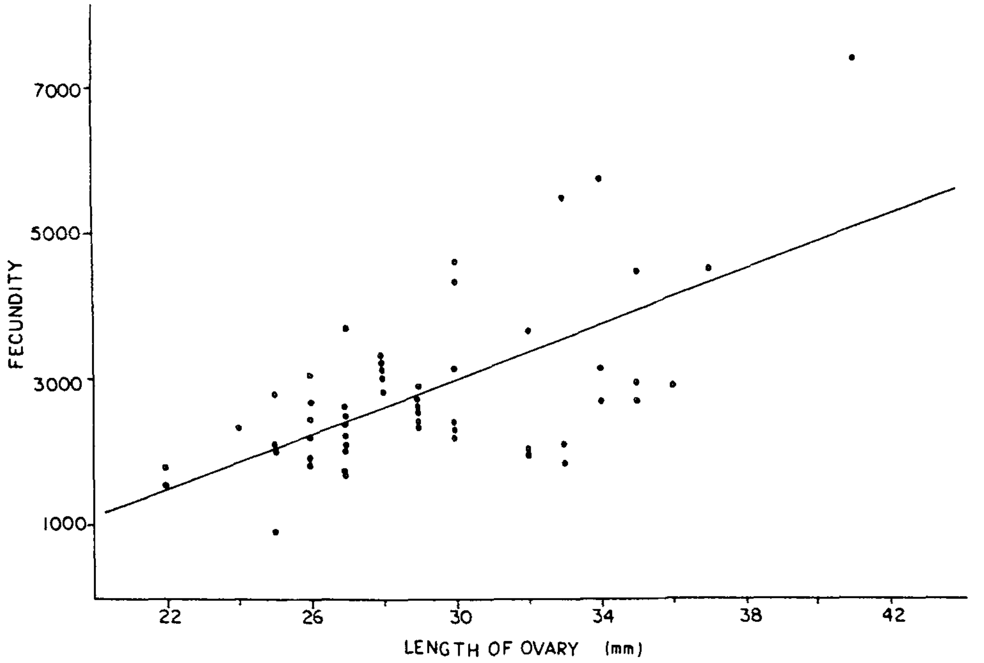

Figure 3. Length of ovary-fecundity relationship in *R. daniconius*.

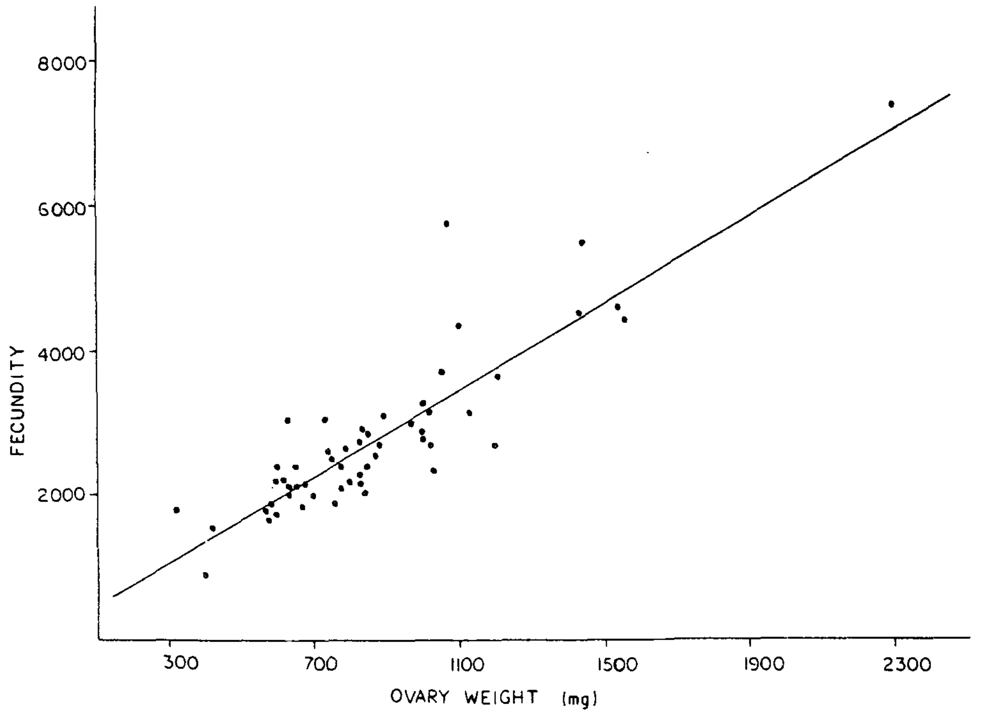

Figure 4. Ovary weight-fecundity relationship in *R. daniconius*.

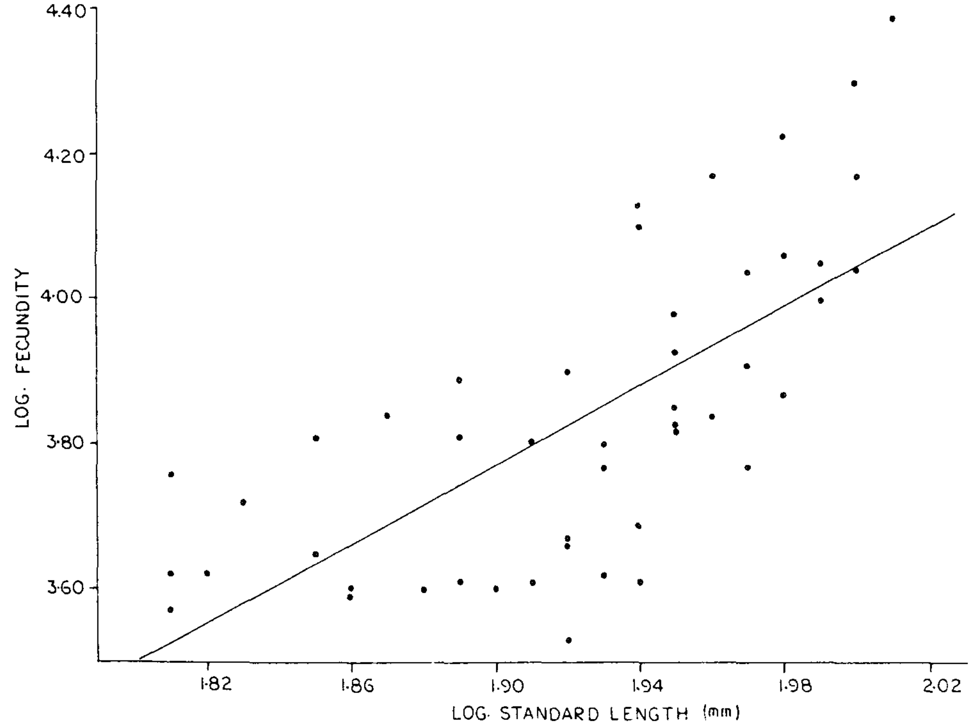

Figure 5. Standard length-fecundity relationship in *P. amphibius*.

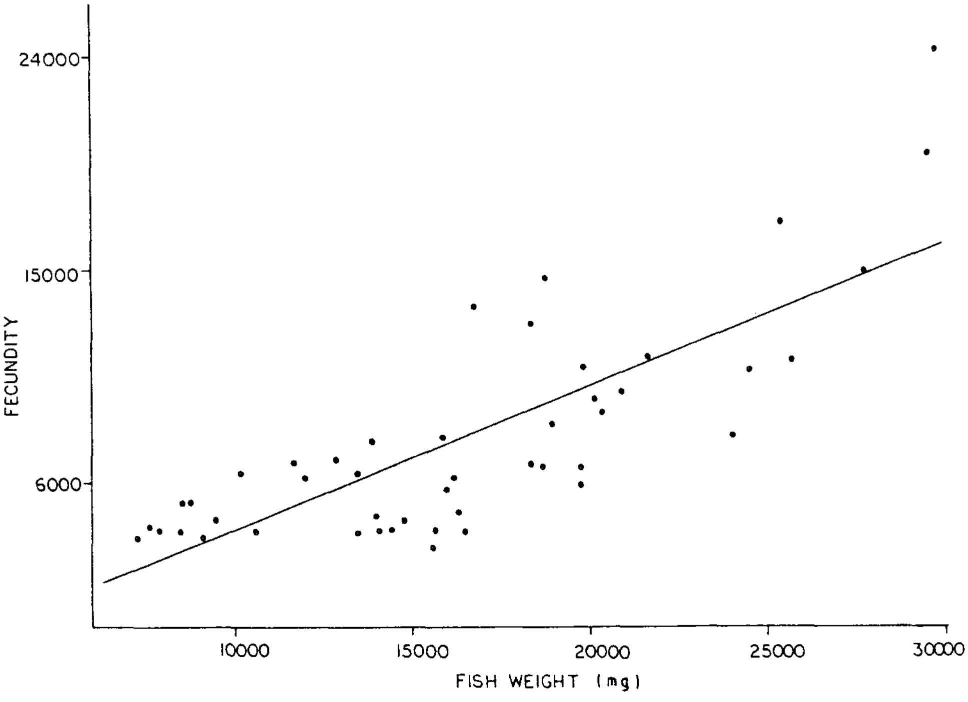

Figure 6. Body weight-fecundity relationship in *P. amphibius*.

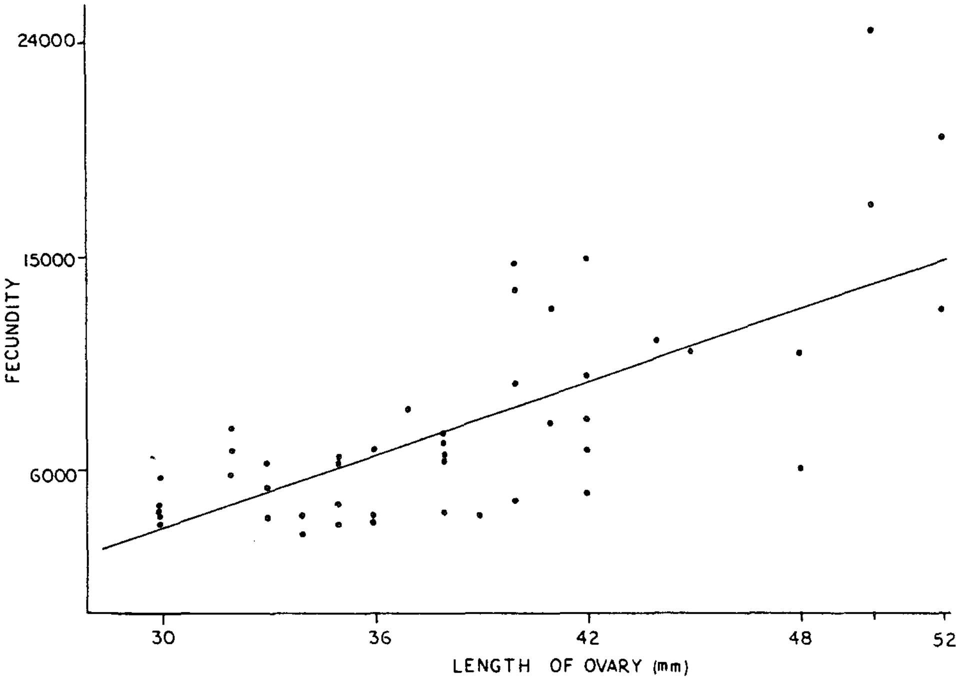

Figure 7. Length of ovary-fecundity relationship in *P. amphibius*.

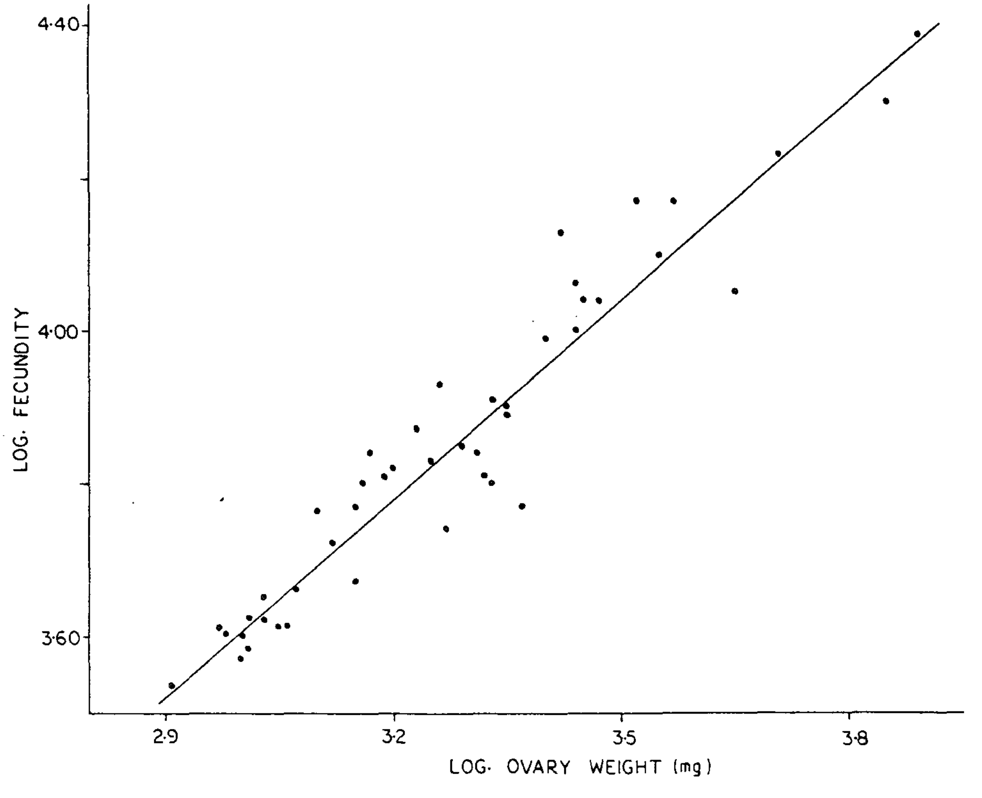

Figure 8. Ovary weight-fecundity relationship in *P. amphibius*.

conversion efficiency than *R. daniconius* (Prem Kumar and John 1984). It may also be more easy for the fish to absorb the nutrients from the organisms living in the same medium than from the terrestrial organisms.

The curvilinear relationship between the fecundity and standard length as seen in *R. daniconius* and *P. amphibius* agrees with the findings of Gupta (1968) and Sinha (1975). But, according to Qasim and Qayyum (1963) in fishes which seldom grow more than a few inches in length there exists a linear relationship between body length and fecundity.

A linear relationship between fecundity and fish weight similar to that in *R. daniconius* and *P. amphibius* has been reported in *Labeo fimbriatus* by Bhatnagar (1972), in *P. sarana* by Sinha (1975) and in *R. daniconius* by Nagendran *et al* (1981). Yuen (1955), however, has reported a curvilinear relationship between fecundity and fish weight in the big eye tuna.

The linear relationship between the ovary weight and fecundity as seen in *R. daniconius* is a common feature which has been reported in several fishes (Pantalu 1963; Qasim and Qayyum 1963; Bhargava 1970; Bhatt *et al* 1977; Nagendran *et al* 1981). On the other hand, the curvilinear relationship which was found to exist between the fecundity and ovary weight in *P. amphibius* has also been reported in other freshwater fishes (Rita Kumari 1977; Babu 1981).

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References

Alikunhi K H and Chaudhuri H 1954 On the life history and bionomics of the carp minnow, *Chela phulo* (Hamilton); *Proc. Indian Acad. Sci.* **B39** 76–90

Babu N 1981 Studies on the genus *Amblypharyngodon* Bleeker (Pisces-Teleostei-Cyprinidae) from South India Ph.D. Thesis, University of Kerala, India 520 pp.

Bhargawa R M S 1970 The fecundity of *Heteropneustes fossilis* (Bloch); *J. Bombay Nat. Hist. Soc.* **67** 583–588

Bhatnagar G K 1964 Spawning and fecundity of Bhakhara reservoir fishes; *Indian J. Fish.* **11** 485–502

Bhatnagar G K 1972 Maturity, fecundity, spawning season and certain related aspects of *Labeo fimbriatus* (Bloch) of river Narmada near Hoshangabad; *J. Inland Fish. Soc. India* **4** 26–37

Bhatt V S, Dalal S G and Abidi S A H 1977 Fecundity of the freshwater catfishes *Mystus seenghala* (Sykes), *Mystus cavasius* (Ham.), *Wallagonia attu* (Bloch) and *Heteropneustes fossilis* (Bloch) from plains of northern India; *Hydrobiologia* **54** 219–224

Bisht J S and Upadhyay J C 1979 Studies on fecundity of a freshwater teleost, *Barilius bendelisis* Ham.; II All India Seminar on Ichthyology Abst. p. 95

Das S M 1964 A study on the fecundity of some freshwater fishes of India with a note on a new concept of comparative fecundity; *Ichthyology* **3** 33–36

Gupta M V 1968 Observations on the fecundity of *Polynemus paradiseus* Linn. from the Hooghly estuarine system; *Proc. Nat. Inst. Sci. India* **34** 330–345

Jhingran V G 1977 *Fish and fisheries of India* (New Delhi: Hindustan Publishing Corporation) 954 pp

Nagendran R, Katre Shakuntala, Natarajan G N and Vasan H R K 1981 Observations on the fecundity of the cyprinid *Rasbora daniconius* (Hamilton); *Proc. Indian Acad. Sci.* (*Anim. Sci.*) **90** 381–388

Pantalu V R 1963 Studies on the age, growth, fecundity and spawning of *Osteogeneiosus militaris* (Linn.); *J. Consperm. Int. Explor. Mer.* **28** 295–315

Parameswaran S, Radhakrishnan S and Selvaraj C 1971 Some observations on the biology of the carp minnow, *Osteobrama cotio* (Hamilton); *J. Inland Fish. Soc. India* **3** 103–113

Pathak S C and Jhingran A G 1977 Maturity and fecundity of *Labeo calbasu* (Ham.) of Loni reservoir, M. P.; *J. Inland Fish. Soc. India* **9** 92–93

Pathani S S 1981 Fecundity of mahaseer *Tor putitora* (Ham.); *Proc. Indian Acad. Sci.* (*Anim. Sci.*) **90** 253–260

Prem Kumar K and John P A 1984 Observations on the comparative efficiency of the allochthonous and autochthonous food of fishes based on their biochemical analysis; *An. Centro Cienc. Mar Limnol. Univ. Nal. Auton. Mexico* (in press)

Qasim S Z and Qayyum A 1963 Fecundities of some freshwater fishes; *Proc. Nat. Inst. Sci. India* **29** 373–382

Rita Kumari S D 1977 Studies on the loaches of Kerala Ph.D. thesis, University of Kerala, India 538 pp

Saxena O P 1972 Studies on the maturity and fecundity of *Rita rita* (Hamilton) of Ganga river system; *J. Inland Fish. Soc. India* **4** 169–182

Selvaraj C, Radhakrishnan S and Parameswaran S 1972 Notes on the breeding season, fecundity and life history of a minor carp, *Labeo boggut* (Sykes); *J. Inland Fish. Soc. India* **4** 87–97

Sinha M 1975 Observations on the biology of *Puntius sarana* (Hamilton) of Loni reservoir (Madhya Pradesh). 2. Maturity and fecundity; *J. Inland Fish. Soc. India* **7** 49–57

Varghese T J 1973 The fecundity of the rohu, *Labeo rohita* (Hamilton); *Proc. Indian Acad. Sci.* (*Anim. Sci.*) **B77** 214–224

Yuen H S H 1955 Maturity and fecundity of big eye tuna in the Pacific; *Spec. Sci. Rep. U.S. Fish Wildl. Ser. Fish.* **150** 30 pp